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A. A. McKoy

PROCEEDINGS

OF THE

ANNUAL MEETING

OF THE

WESTERN RAIL ROAD COMPANY,

Fayetteville, March 15th and 16th, 1858.

WITH REPORTS OF THE

PRESIDENT & ENGINEER,

AND OF

E. EMMONS, State Geologist.

FAYETTEVILLE:

PRINTED BY EDWARD J. HALE & SON.

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NORTH CAROLINA
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Officers of the Company for the Year 1858.

President,

CHARLES B. MALLETT.

Secretary and Treasurer,

JNO. M. ROSE.

Directors,

GEORGE McNEILL.
JAMES KYLE.
H. L. MYROVER.
W. T. HORNE.
A. A. McKETHAN.
S. J. HINSDALE.
JNO. H. COOK.
THOS. S. LUTTERLOH.
WM. McLAURIN.

Chief Engineer,

WM. A. KUPER.

PROCEEDINGS.

FAYETTEVILLE, MARCH 15, 1858.

At the Annual Meeting of the Stockholders of the Western Rail Road Company, assembled this day, agreeable to the Bye-Laws of the Company,—

On motion of Charles B. Mallett, Esq., the Hon. J. G. Shepherd was called to the Chair. John M. Rose acting ex-officio as Secretary of the meeting.

On motion, the meeting adjourned till to-morrow, 4 o'clock P. M.

MARCH 16, 1858.

Meeting assembled as adjourned.

Messrs. George McNeill, William T. Horne, and John Shaw, were appointed a Committee to ascertain if a majority of stock was represented; who reported, that 388 shares of the individual stock was represented in person and 167 shares by proxy; that the Town of Fayetteville was represented by the Mayor, A. McLean, Esq., and A. A. McKethan, Esq., and the County of Cumberland by Daniel McDiarmid and Gurdon Deming, Esquires—each one thousand shares; making a total representation of 2555 shares, a large majority of all the shares.

The Annual Report of the President and Directors of the Company was read and adopted.

The Stockholders proceeded to the election of President of the Company, when Charles B. Mallett, Esq. received all the votes cast, and was duly elected.

The following gentlemen were elected Directors, by nearly a unanimous vote, viz: George McNeill, H. L. Myrover, T. S. Lutterloh, James Kyle, Wm. McLaurin, S. J. Hinsdale, A. A. McKethan, John H. Cook, and Wm. T. Horne.

On motion of E. J. Hale, the following resolution was unanimously adopted:

Resolved, That the Board of Directors be requested to pub-

lish in the Town papers, and in such other mode as may seem expedient to them, the very able and satisfactory Report of the President, or such portions thereof as may be of general interest and importance, together with such other matter as they may deem useful to enlighten the public mind on the great interests involved in this work.

Messrs. A. W. Steel, A. M. Campbell and Henry Lilly were appointed Examining Committee on Accounts, under the Bye-Laws, for the ensuing year.

Adjourned.

JOHN M. ROSE, Sec'y.

REPORT OF THE PRESIDENT.

FAYETTEVILLE, 15th MARCH, 1858.

To the Stockholders of the
Western Rail Road Company:

The President and Directors beg leave to submit the following Report of the operations of the past year, showing the present condition and future prospects of your Road.

It will be recollected that at the last annual meeting, our prospects—though better than they had been—were by no means flattering. We had just failed to obtain aid from the Legislature, and were uncertain how Cumberland County would respond to the appeal we had made to her,—many thought that if the County failed us we would have to give up, and probably we should; but she did not fail. She authorized by a very large majority a subscription of $100,000, and, at the June term of the County Court, the Justices made the subscription. This confirmed the faith of the believing, and encouraged the hopes of the doubting. Immediately after this subscription was made, the graduation on the 2d Division was put under contract.

The Treasurer's statement, marked A, shows that the whole amount subscribed to the capital stock is $341,232 19, viz:

By the Town of Fayetteville,	$100,000 00
" " County of Cumberland,	100,000 00
" Individuals,	141,232 19
Making, as above,	$341,232 19

To which add, for work already done and work now under contract, payable in stock, $18,531 92, and the total capital on the completion of the present contracts will be $359,764 11.

The following statement from the balance sheet, shows the present condition of the Company:

Total receipts on account of Stock collections,		$290,212 62
" " interest on Town Bonds and rents,		9,097 75
Due on bills payable, including notes given for iron,		64,762 38
		$364,072 75

There has been disbursed as follows:

Construction account, including Engineering and contingencies,		$136,373 99
Land damages for right of way and Depot grounds,		13,746 60
Assets on hand:		
County Bonds,	$18,800 00	
Plank Road Stock,	4,700 00	
Town Bonds,	87,000 00	
Bills receivable,	6,750 00	
Bonds guarantied by the State of N. C.,	54,500 00	
Cash,	1,528 70	
1000 tons Rail Road Iron,	40,673 46	
		$213,952 16
		$364,072 75

The very able report of the Chief Engineer (W. A. Kuper, Esq.,) shows in detail the amount of work which has been done, and its cost; also, the estimated cost of the entire Road when built and equipped.

The roadway complete will cost $614,436. One hundred thousand dollars will furnish sufficient rolling-stock for the present: more can be added as the Coal and Iron are developed and the business increases. So for $714,436 the Road can be built and put in operation.

Of this amount we have subscribed and will soon have paid in $350,000; and we will then have eleven miles of Road finished and in operation, fourteen miles graded and ready for the superstructure, and eighteen miles surveyed and ready for the contractor.

With this property or out of it, or by means of it, the remainder of the Road must be completed; how or by what means or how soon remains to be seen. But having done thus much, and having demonstrated that the amount we need will com-

plete the Road to the Coal fields, we have an abiding confidence that a Road with such prospects of business, and to cost so little, will soon be built. Few Roads have been projected with as fair prospects of an immediate business, and of being so speedily worked up to their maximum capacity.

For about 25 miles this road will pass through an untouched pine forest; the timber, lumber and naval stores from which would furnish a fair business for the next ten years. And as round pines within a reasonable distance of transportation are becoming very scarce, the boxing and cutting of this new supply will be simultaneous with the laying down of our rails. In fact, the purchase of iron for only 12 miles has already started the axemen, and we have reliable information that if this 12 miles is laid down by July next, we will have the transportation of at least 40,000 bbls. With 10 miles more, and another year, the quantity would be doubled, and it will continue to increase for many years. For as naval stores will bear hauling 10 miles, there will be a scope of country 20 miles wide and 25 miles long, or 320,000 acres, to which the road will be accessible; and the increasing demand for those products which the long leaf pine alone can furnish will insure the working of all this land, affording to the road, as before stated, a fair business for many years.

But the Coal and Iron on Deep River are the great, the inexhaustible sources from which the road will derive its business. The quantity and quality of the Coal and Iron Ores are so fully and ably set forth in Prof. Emmons's reports, and the correctness of his reports is so fully proven by the actual working of the Coal, that the estimated extent of these deposits may be set down as a fixed fact. When they are set in motion, that is, worked, as they will be on the completion of the road, then will our harvest begin; for then, and ever after, will we have as much freight as we can carry—which is for a single track 500,000 tons per annum, and for a double track 1,200,000 tons. With that amount of freight, and the cost at which the road will have been built, it must pay better than any road in the country.

No roads in the country earn as much per mile as Coal roads. And but for their immense cost, (owing to the inaccessible location of most coal fields,) none would pay larger dividends.

The Reading road is 93 miles long, and cost, equipped, above $20,000,000, or $200,000 per mile; and yet it earns an interest of more than 6 per cent. on its cost. This is essentially a Coal road. Let us compare it with two prominent roads in New York, which are not Coal roads, the N. Y. Central and the Erie.

Track of N. Y. Central cost per mile,	$34,492
" " Erie " "	45,305
" " Reading, double $155,000, single	100,000

In 1857 the Central transported 670,073 tons, the Erie 842,-054, and the Reading 1,897,308 tons. The length of the Central is 300, of the Erie 400, of the Reading 93 miles. This tonnage includes way and through freight; that is, every ton moved, be the distance long or short; and on the two first roads the way freight was about four times as much as the through freight, making in fact each of those roads, as compared with the Reading, four separate roads, connecting populous towns, and running through a highly cultivated country. And yet the Reading Road, because it runs to a Coal field, transported twice as many tons as one of them, and more than three times as many as the other; and compared with an equal length of the other roads it transported nine times as many tons as one and twelve times as many as the other. But for the Coal the Reading Road could not be run for six months; in fact, but for the Coal, the road would never have been built—for there is no other trade or business in this country that would justify the building of a road at such a cost. And yet because of the Coal this road is able to earn a fair interest on its immense cost, competing as it does mile for mile with the very best lock and dam navigation yet constructed. If then this road, costing for the track alone $100,000 per mile, and running but 9 months in the year, can earn an interest of even 6 per cent., what dividends may we not expect from our road, having, as it will, the same kind of freight, running the whole year, and costing (for the track) $15,000 per mile?

The questions have been asked: Will all this Coal be sent to market? Where can a market be found? Can it be furnished at a price that will ensure its use? In answer to the last inquiry it is enough to say, that the Deep River Coal is nearer to the Ocean, and can be put on shipboard cheaper than any coal on this side the mountains. In answer to the other questions, let

us look for a moment at the history of the Coal trade of Pennsylvania.

In 1820 the first Anthracite was sent to market, 365 tons. In 1838, 18 years after, 739,000 tons. In 1856, after another 18 years, the amount exceeded 7,000,000 tons; and it is not at all likely that this rate of increase will diminish for many years. In fact, much the greatest increase has been within the last 8 years. Up to that time, the use of Coal on steamboats was scarcely known; it was thought impracticable for them to use Coal. Now all steamboats use it where it can be had; and since it has been demonstrated that Ocean Steamers can be used, the amount consumed by steamboats will be doubled in the next 10 years. At this day the use of Coal for Locomotives is in its infancy. In ten years the amount used on railroads will equal that used on steamboats. It must be so; for the forests in the Atlantic States cannot much longer supply the vast amount of wood required even by the roads now built. The amount of wood consumed by railroads is almost incredible.

In 11 States from Maine to Maryland inclusive, there were in 1855, according to the report of the Secretary of the Treasury, 10,491 miles of road in operation, on which the mileage of passenger trains was 20,479,533. That of freight trains is not given; but it is fair to presume that it was as much—it was so on the N. Y. Central last year—making for both 40,959,000: to which add 10 per cent. for the annual increase, and the probable mileage for 1857 was 45,918,000. The superintendent on the N. Y. & Erie road reported in 1856 that one cord of wood was consumed for every 27½ miles run. But allow 30 miles to the cord, and there were consumed in 1857 1,530,600 cords: or a pile 4 ft. high, 4 wide, and 2,320 miles long; or, if the year's supply had been laid in at one time, and distributed along the roads, there would have been at each mile post a pile more than a quarter of a mile long.

This gives some idea of the amount of fuel required by these roads; and being in old and thickly settled States the supply must soon fail. Even now the price of wood is so high (averaging about $3 per cord) that very few of the roads can make dividends. They must find a cheaper fuel, or their stocks will continue to depreciate. Coal is the only substitute, and why should it not be used? Why has it not been used? All the

roads in England use bituminous Coal, or Coke made from it, and that must be the reason why some of the English roads are run at an expense for fuel of 7 cents per mile run, while the expense on the N. Y. Central last year was 22 cents per mile run. Many of the roads at the North are aware of the difficulty, and are experimenting on Coal. So far experiments show that Anthracite is not adapted to Locomotives, or rather, that no Locomotive has been adapted to the use of Anthracite. Prof. Silliman says of it: "No fuel in the world can be compared to it for the purposes for which it is especially adapted, but it is not adapted for Locomotive steam use." Railroads then must look to bituminous and semi-bituminous Coal.

Of the first Pennsylvania produces none this side of the mountains. That produced by Maryland has to be transported 200 miles by railroad to Baltimore. Deep River Coal, with 43 miles of railroad, is brought as near the Ocean as the Cumberland Coal is at Baltimore, and is of better quality. Pennsylvania produces a semi-bituminous Coal, but that has to be transported about 200 miles by Road. Deep River also produces the semi-bituminous, and 43 miles of road will take it to free navigation. These two States will be our chief competitors in supplying the Locomotives of the Atlantic States with fuel, and from them we have nothing to fear. And when it is remembered that the vast and rapid increase in the consumption of Coal was prior to and independent of its extensive use for steam purposes, and before its use for Locomotives has begun, there certainly can be no danger of glutting the market with any quantity that Deep River can produce, or our road can transport.

The Iron to be produced on Deep River is another source from which our road is to derive its freights. Will there be a demand for it? Can it be made and transported at a price that will pay? Look for a moment at the iron trade of the country.

"The total consumption and manufacture of Iron in the U. States in 1840 was $35,398,691. In 1850 it was $74,806,732. For 1855, estimated at same rate of increase, $96,068,271. The production of Iron in 1855, on the same ratio of increase as between 1840 and 1850, would have been 700,000 tons; whereas, the actual production was 1,000,000 tons." Showing that the demand and ratio of increase are not falling off but improving.

With this ratio of increase there certainly will be a demand for all the Iron Deep River can produce or our road transport. And it will be produced if we or anybody else will take it to market. Prof. Emmons and other scientific gentlemen have demonstrated that no other section of the country possesses greater if as great natural advantages for producing Iron.

In connection with the demand for Iron and Coal, the following extract from an English writer may not be out of place. He says: "About 400 Iron furnaces of Great Britain consume annually 10,000,000 tons of Coal, and 7,000,000 tons of Iron ore in order to produce 2,500,000 tons of Pig Iron, of the value of upwards of £8,000,000. And we must not be unmindful that these great smelting establishments, in order to meet the vast and growing demand for iron rails, houses, churches, ships, &c., are now constantly augmenting in number; which, with other demands, too obvious to particularize, will also tend to increase immeasurably the present consumption of Coal. In short, astounding as are the statistical facts just enumerated, they assume a still more transcendent and portentous importance, when viewed in relation to the future. * * *

"To develope, to conservate, to investigate with jealous care this grand element of internal strength and prosperity, the "*primum mobile*" of our multitudinous and world-wide progress, cannot but be considered a sacred duty by every man possessing a single spark of patriotism in his breast. Far be it from me to exhibit any unnecessary prominence in sounding the tocsin of alarm; but it were impossible for any one at all conversant with the existing facts and prospective bearings of this subject, not to entertain some serious forebodings as to the permanent capabilities of our English Coal fields.

"The many and laborious calculations which, in order to arrive at some conclusive information on this vital point, have been entered into by men well versed in the matter, have resulted in very discouraging declarations."

It would appear from this that the great Coal fields of England are not inexhaustible; and that while the demand of the world for Coal and Iron is steadily and rapidly on the increase, the chief source from which the demand has been supplied is thought to be failing. And here let it be borne in mind that England produces no Anthracite Coal; all of her Iron is made,

all her machinery is driven, all her houses are warmed and lighted by Bituminous Coal, just such as Deep River produces in immediate proximity with the Iron ore. In fact, the best description of ore (the black band) is interstratified with the Coal, and is taken from the mine in company with the fuel that is to convert it into iron. What bituminous Coal has done for England it can do for us. And should the apprehended failure of the English Collieries prove true, the discovery of Coal on Deep River may yet be as important to the world as it certainly is to North Carolina.

Any State or country within whose borders nature has placed extensive deposites of Coal and Iron ore has within her reach the elements of wealth and greatness. If, after these deposites are known to exist, such State or country does not become wealthy and great, the fault is her own. England has these elements, and has so used them as to become the richest and most powerful nation in Europe.

Pennsylvania has them, and to develop them she expended $40,000,000. And during the last year she sent to market 7,000,000 tons of coal and 447,728 tons of iron, worth $45,709,-120. Thus making her surplus products for one year more than equal to the whole cost of her improvements.

North Carolina has these deposites. We will not ask what she has done; for although her coal was discovered before that of Pennsylvania, it was lost sight of before its true value was known. But now that England, Pennsylvania and Maryland have pioneered the way, and demonstrated what Coal can do and has done, and now that her Coal has as it were been re-discovered, we do ask what she will do? Nature has made the deposites—science has discovered them—skill and labor have verified the discovery—her neighbors have taught her the use and value of them. Will she so use them as to become wealthy and great?

Wealth is the accumulation of the surplus products of labor; and the reason why coal-producing, or rather coal-working States, have become wealthy, is, that labor bestowed in that way affords more surplus than any other—no other raw material can be fitted or prepared for consumption at so little cost.

Labor employed in agriculture where the products are other than Cotton or Rice, cannot under the most favorable circum-

stances produce a surplus for export of more than $100 to the hand. Whereas labor employed in coal mining, can produce an article for export worth more than $1000 to the hand, and at the same time be furnishing to the agriculturist a home market for his surplus products. If one-tenth of the surplus wheat of North Carolina had been consumed at home by men engaged in digging Coal and making Iron, her exports would have been counted by millions instead of thousands. She has the wheat, the coal and the iron: she has provided a way to market for the wheat, let her now provide—let her give aid in providing—a way for the coal and iron to market,—and a way for the wheat to the coal and iron,—and in five years she will be a creditor State: Instead of exchange on New York being at a premium of 5 per cent. it will be at a discount.

Just let it be made certain that a way will be open for the Coal, and the effect will be felt immediately; for capitalists now stand ready to work both the coal and iron, and every dollar brought into the State by them is equivalent to an export to that amount. Two or three hundred thousand dollars brought in in that way would relieve us, and set the coal in motion; after that, our imports would never again overtake the exports.

We do not pretend that our Road is the only outlet for the coal that should be opened, for we believe that every practicable route should be made available, and the coal and iron allowed to go in every direction. But we do contend that our Road will afford the cheapest, the most certain and the shortest route to market, and consequently should be and can be the first completed. And when completed, it will do more for North Carolina than all the roads she has built have done or can do; and it will do more for the stockholders than any investment they have ever made.

C. B. MALLETT, Pres't.

REPORT OF THE CHIEF ENGINEER.

ENGINEER'S OFFICE, W. R. R.,
March 1st, 1858.

To the President and Directors of the
Western Rail Road Company:

GENTLEMEN:

I have the honor to submit the following Report of the operations of the Department committed to my charge, for the fiscal year ending this day, and to offer such suggestions relative to the future as I deem essential to ensure its speedy completion, together with a few remarks touching its capacity as a Coal bearing Road, and its value as a stock investment. With this preface I shall now proceed, first to define the

Location of the Road.

At the time I entered upon the discharge of my duties as your Engineer, on the 1st July last, the location was definitely made, by my predecessors, except that portion from the Cape Fear River through Campbellton and the town of Fayetteville to near the Mile Branch, a distance of 2¾ miles, caused by the inability of your Board to negotiate with parties for the right of way, upon fair and reasonable terms. This right of way, owing to the limited means of the Company, was a serious obstacle, and it finally required several months' negotiations with different parties before it could be satisfactorily obtained and the location fixed.

We now have the whole location made from the terminus on Cape Fear River at Fayetteville to that on Deep River, a distance of 43 miles; but deeming it important that a detailed statement of its features should be placed on record, (not heretofore done,) as a basis for future calculations, &c., I submit the following:

The point selected for the terminus on Cape Fear River is about one quarter of a mile below the steamboat landing: this selection I consider judicious, first, because the channel of the River is here and for half a mile below close to the shore, and secondly, because your Company were the owners of nearly all the land covering this river front; two advantages which could

not have been obtained elsewhere and that will enable the Company to adopt and carry out any plan for the delivery of Coal into boats at a much less cost. For the purpose of effecting this delivery at all stages of water in Cape Fear River, I have not as yet matured any plan; still I feel sanguine, indeed certain, that it can be done, with but little cost, delay, inconvenience or injury to the Coal.

Leaving our terminus, the line runs off on a tangent 2000 ft. long, making an angle with the general course of the River of 36 degrees, thence by a 4° curve 770 feet long, it strikes into the corporation limits of Fayetteville at the termination of Russell street, following this and Mumford street on a tangent for a distance of three-quarters of a mile, thence with an 8¾ degree curve 1000 feet long it strikes Hay street a short distance above the Seminary, thence with a short tangent and 5° curve 933 feet long it crosses Hay street and Maiden Lane to the location selected for the Town Passenger and Freight Depots. It may be now stated that the Line from this place assumes the proper course for the proposed terminus on Deep River, which the accompanying map, exhibiting the Coal region, will designate and so direct, being but 5 per cent. longer than an air line, that I shall omit designating the particular localities of its tangents and curves, and make allusions only to the topographical features of the country traversed.

From Fayetteville to Lower Little River a distance of 13 miles, the only stream the line encounters of any consequence is Cross Creek—two crossings of which are made, within a mile of Fayetteville,—the first to be spanned by a Truss Bridge 34 ft. long, with its top stringers 15 feet above common low water, the second by Tressel work 1000 ft. long and an average height of 20 feet. This structure having been erected before I took charge of your road, it was not in my power, or advisable at this time, to change plan by substituting a Culvert and Embankment, as I have been enabled to do elsewhere, for the aggregate 6300 feet originally designed to be used on other portions of the Road. I propose however, at some short time after the track is laid, doing this, so that structures of that kind, objectionable in many respects upon Rail Roads, may not be found on yours. The remarks I make relative to this subject are not designed to reflect upon the professional abilities of my prede-

cessors, for the plan of the work had then to conform to the pecuniary means of the Company—the want of which is seldom taken into consideration by the public, when judging of the professional abilities of an Engineer.

The grading on this Division is light, with the exception of a cut 3000 ft. long and extreme depth of 40 feet, through the ridge dividing the waters of Cross Creek and Lower Little River,—the materials composing it are clay and sand, without any rock. Lower Little River is 75 feet wide and the water 3½ feet deep, over which a Lattice Bridge 200 feet long, divided into two spaces of 50 feet each, and one of 100 ft. is to be built —the track passing 2½ feet below its top chords and 35 feet above common low-water mark—the Piers and Abutments for which are to be of masonry. From Lower to Upper L. River, distance miles, the country is very much broken in its outline, by the high ridges dividing the waters of Barbecue Creek, Miry Branch, Gum and Cypress Swamps, rendering necessary cuts of 20 to 40 feet, and fills of 20 to 36 feet, to bring the road to the maximum grades adopted. In the cuts, however, but a small quantity of rock will be found, and the streams above enumerated will not require in any instance Culverts of greater space than 4 feet, to pass their volume of water. I have on this as well as on a part of the first Division, on account of the impossibility of procuring stone within a reasonable distance, used Iron pipes of from 12 to 30 inches diameter, to an aggregate length of 450 feet; these substantially laid on timber foundations will answer the purpose designed, and endure for a long period of time.

From Upper L. River to Deep River,—distance miles, the country changes to a greater uniformity of surface—the soil, however, to be excavated contains less sand and more clay and rock, but the cuts and fills being much less, the grading of this Division will not cost near as much as the first and second. All the Bridging necessary, will be in one span of 100 feet to cross Upper L. River, the track running over its top chords and feet above low-water. The abutments to be stone. Culverts of 3 feet opening will be sufficient to vent the waters of any of the branches crossed.

By reference to the map heretofore alluded to, and copied from the one appended to Professor Emmons' Geological Re-

port of 1856, it will be perceived that your Road, (which I have designated by a red line,) enters the Coal region at Martin Dye's, a point where, to quote the language of that report, "the existence of Coal has been determined by the auger and excavations," and that from thence the location of your Road, a distance of miles to Deep River, is within the limits of the Coal region; this fact of itself is of vast importance to the present interests and prosperity of your Road, but not more so, than the position which it will have taken to command by an easy extension, access to all the Coal Regions of Deep River and securing an amount of tonnage in Coal alone equal to its utmost transporting power.

I have presumed in these remarks, that the parties holding the Coal region traversed by your Road will at the proper time make the necessary arrangements to mine a sufficiency for the first year's tonnage; but to guard against a failure in that respect, I have added to my estimates the cost of 3 miles additional roadway. This I consider ample to extend it to mines that are now prepared with the necessary fixtures, &c. to commence operating on a large scale, and only now deterred from doing this for the want of an outlet to market.

Curvature and Grades.

The maximum degree of curvature adopted in the location, was three degrees or a radius of 1910 feet; but on account of the difficulties heretofore alluded to—right of way through Fayetteville—it had to be exceeded in three curves of 4°, 5° and 8¾°, for an aggregate distance of 1703 feet. In view of the retarding effects of this curvature, I have so arranged the grades on them that a Locomotive with its maximum load will traverse, going in either direction, with as much facility as on other parts of the line. The number of degrees of curvature on the whole line is 936½, or an average per mile of 21 78-100 degrees. The aggregate length of tangents is 34 miles 4440 feet, or a fraction over 80 per cent. of the distance.

For a more definite understanding of the effect the curvature adopted will have on the capacity of the Road, I refer you to the accompanying Table marked A.

For the necessary information relative to the grades, I refer you also to the Table marked B, except to state that the maximum grade against the trade is 31⅔ feet per mile, and the ele-

vation of the highest summit crossed above the initial point is 345 feet. The difference in the level of the water in Cape Fear River and Deep River 181 9-10 feet.

Plan and Manner of Constructing the Work.

The roadway in excavations is 18 feet wide, and on embankments 12 feet. The slopes in excavations vary from ½ to 1 to 1, and for embankments 1½ to 1. In borrowing materials for the formation of embankments, contractors are required to do so from one side of the excavations, provided the haul is not over 800 feet. If taken from pits, a berm sufficient to cover the ground for a double track is left, which is also required where materials are wasted from an excavation.

All the Bridges on the line are to be built of wood of the best description, and are to be properly protected from the weather. The most important are at Lower L. River, 200 feet, and Upper L. River 100 feet long,—the aggregate length on the whole line being but 350 feet. It is gratifying to be able to state here, that my apprehensions relative to being able to procure stone of a suitable character for the Abutments and Piers, as well as for all the Culverts on the line, other than those contemplated of brick and iron, have been removed, quarries of stone having been lately discovered, sufficiently near to their respective locations, as to render it available for that purpose, at a reasonable cost. All other works connected with and appertaining to the Graduation and not herein particularly noted, are to be built in a substantial and workmanlike manner.

The superstructure of the Road is formed with a rail of the T. pattern of 52 lbs. per yard, laid on cross ties 8 feet long, and hewed to a thickness of 6 inches, placed 20 inches from centre to centre, and firmly bedded; the joints of the rails are confined by a wrought Iron lipped chair, weighing about 7¼ lbs. With the track thoroughly drained by ample side ditches and properly ballasted, it will give a permanent Roadway.

As it might be questionable with your Board whether the rail proposed above, would possess sufficient strength and durability for the heavy tonnage of your Road, and that a rail weighing not less than 60 lbs. per yard would be required, I have carefully considered the subject of rails, and my conclusions, derived from theory and practical observations, are that

economy, permanency and durability of track and rail, is not dependent upon increased weight of rail alone, but to the frame of the track and form of the rail,—in this I am sustained by distinguished Engineers, if I may be allowed to judge from their reports,—for instance the Chief Engineer of the N. Y. and Erie R. R. in his report to that Company on the 1st October last, in speaking of the character and wear of rails, states as follows: "The iron rails first laid upon the road from Piermont to Goshen in 1841, weighed 56 lbs. per lineal yard of rail; since that time the weight of the rails as they were laid down at various periods, were increased successively to 58, 60, 63, 65, 68, 72 and 75 lbs. per yard, with the hope always of obtaining by this means a more durable and economical track. That expectation has not been realized, nor is it probable that the object thus sought will be found in that direction alone. As the weight has been increased, the quality of the iron has, almost uniformly deteriorated. The upper portions, or heads of the heavy rails, crumble and laminate, as soon as, or even sooner than they do on the lighter ones. Some of the first rails laid down between Piermont and Goshen are yet in a fair state of preservation, while many of the latest and heaviest pattern have failed.

"But in both cases the destruction goes on rapidly at the ends and at other points where the rails are not uniformly supported. When the ties yield unequally, the light fibrous rail accommodates itself to that inequality, while the heavy, but granular and unrefined rail will break."

If, therefore, as is stated above, the upper portions or heads of a heavy rail crumble and laminate as soon as they do in the lighter rail, and that also, when similarly supported, the only inquiry remaining to be answered is, as to strength of rail, to support the transverse and lateral strain exerted by the load. This I propose answering more in detail.

Upon an examination of the best form of rail, weighing from 50 to 75 lbs. per linear yard used on Railroads in the United States, I find their breadth of base and thickness of head to vary but a fraction from each other—the difference in their form, I consider to be in depth only—their comparative strength therefore to resist a vertical strain will be as the square of their depth and inversely as their length. By placing the

cross-ties but 20 inches apart, instead of 24 inches, the general rule adopted on R. Roads, and taking the depth of a 52 lb. rail at 3½ inches and that of a 60 lb. rail at 3¾ inches, I ascertain by the application of the above law, that the comparative strength of the 52 lb. rail to resist a vertical strain, will be to that of a 60 lb. as 220.5 to 210.9, or 4½ per cent. greater. Again, the destruction of a rail being greatest at the joints on account of its continuity being broken, the additional number of cross-ties, or rather their being placed closer, will insure a more permanent support at those places, and will consequently increase its durability. Having now proved, satisfactorily I hope, the superiority of a 52 lb. rail over one of 60 lbs. in strength as laid upon frame of track for your road, and that its durability is superior, I have only to add the following Estimate to show its economy also, and a table showing wear and breakage of rails on the Reading R. Road for a period of 5 years:

The difference in weight between a 52 lb. and 60 lb. rail is 12 57-100 tons per mile, at $60 per ton is,		$754 20
From this amount deduct cost of 528 extra ties and putting down the same at 35 cts. per tie,	$184 80	
And for 700 lbs. extra spikes at 4 cts. per lb.	28 00	$212 80
Difference in favor of 52 lb. rail,		$541 40

Taking the average duration of cross-ties at six years, which is a low estimate, the above sum multiplied by 43, the length in miles of your Road, would give at compound interest an amount sufficient to meet eight-tenths of the cost of first renewal.

TABLE.—*Comparative statement of the wear and breakage of rails from* 1850 *to* 1854 *inclusive.*

Description of Iron.		Per centage of wear.					Proportion of breakage in 1854.
		1850.	1851.	1852.	1853.	1854.	
English 52 lbs.	Light track.	1 3-10	2 6-10	3 2-10	4 5-10	7 8-10	1 bar in 789
" 45 "		1 4-10	1 9-10	2 1-10	3 6-10	5 6-10	" " 14241
" 60 "	Heavy track.	8 3-10	9 4-10	12	12 7-10	18 8-10	" " 143
Phœnix 60 "		4 8-10	6 3-10	5 9-10	6 3-10	5 9-10	" " 428
Moreton's 60 lb.			1 7-10	6 1-10	8 2-10	5 9-10	" " 297

All the buildings, namely, Passenger and Freight Depots,

Warehouses, Water Stations, Shops, &c., are to be built in a neat and substantial manner, and of sufficient size to accommodate the business of the Road for several years after it shall have commenced transporting coal.

Cost of Construction.

The total cost of Graduation, including Bridges, for the whole Road is $314,323 56. This Estimate is predicated upon the prices paid for the work now under contract, to-wit: the first 25 miles from Cape Fear River, and at proposals which have been made by responsible cantractors, for the remaining 18 miles to Deep River. I therefore feel no hesitation in asserting that this amount is sufficient. For a detailed statement of the cost of each section, I refer you to the Tables marked C. and D.

The cost of Superstructure, embracing items for Turnouts, Turntables and contingencies is $300,113 33. The Iron I have estimated at $60 per ton, except that for the first 11 miles, (now purchased) at $54 per ton. The necessary buildings, namely, Depots, Warehouses, Water Stations, Engine House, Shops, including tools to do ordinary repairs of Machinery, and fixtures at Cape Fear River to deliver Coal into the Boats, are estimated to cost $65,000. For Engineering, salaries of Officers, and for land damages $30,000. For the necessary rolling stock to do an annual transportation in Coal of 240,000 tons, one Passenger and tri-weekly freight train, the sum of $270,580, and for 3 miles additional Roadway $45,000. Aggregating the cost of Graduation, Superstructure, &c., as above stated, your Railroad with its equipment will cost when completed $1,025,016 89, or at the rate of $22,282 97 per mile. For details see Tables marked D., E. and F.

Progress of the Work.

Of the Graduation of your Road 25 miles is now under contract; on the first 13 miles from the Cape Fear River at Fayetteville eight-tenths is finished and ready for the superstructure, the principal amount of work yet to be done on this Division is on section No. 6, or at the 11 mile station, where we have about 21,000 C. yards of materials to remove out of the summit cut; its removal however, will be prosecuted vigorously, so that when operations of laying down track shall have reached that point its continuance may not be interrupted. The Grading at the terminus on Cape Fear R. and through

Fayetteville can be prepared in time to commence the track laying by the first week in May. On the remaining 12 miles the work is being prosecuted with sufficient force to insure its completion by the 1st Jan'y 1859,—indeed an additional 7 miles can be made ready for the superstructure by the 1st of October.

A proposal was made last Fall by responsible contractors to execute the Grading on the remaining 18 miles of Road to Deep River by the 1st Jan'y 1859, payments therefor to be two-thirds cash and the balance in first mortgage Bonds, but your Board finding that the existing contracts for Grading and to put in operation at least 13 miles of Road would absorb all the available means of the Company,—it was not accepted.

It is very much to be regretted, that so insignificant an amount, (for I take it for granted that with this additional amount of work done, the Iron could be bought with the first mortgage Bonds of the Company,) should be the cause of delaying the construction of a work, that is to accomplish so much, not for the Stockholders alone, but for the citizens of the counties through which it is to pass, by enhancing the value of their lands and affording an outlet to market for many productions of the soil, mine and forest, now valueless for its want.

Is it not to be hoped that now the work has thus far progressed by the noble efforts of the few, it will receive aid from all who are to be benefitted by its construction,—the burdens equalized,—and its completion insured at an earlier day. Could this be anticipated during this year, but to an amount sufficient to complete the Grading to Deep River, I might safely predict the final completion of your Road by the 1st Jan'y 1860.

All the cross-ties for the first 13 miles have been contracted for, and the iron, chairs and spikes, and the necessary fixtures for turnouts, turntables, &c., purchased. The laying down of the track for this distance has not yet been put under contract; this, however, and all other necessary arrangements will be made with a view to being commenced by the first of May. Should no unforeseen difficulties arise, the whole track can be completed and the trains commence running by the 1st of August. I will here suggest the importance of purchasing Iron sufficient to continue the track to the 13th mile station at once, it being a suitable location for a Depot, and the Turnout, Turntable, Water Stations and other buildings necessary for the ope-

rations of the Road could be permanently arranged and fixed; it would obviate the expense incurred of putting down and taking up temporary arrangements.

Having now given you all the information that I consider essential to a perfect understanding of the location, cost and progress of your Road, I beg leave in conclusion to submit the following Estimate of its capacity, and the revenue to be derived therefrom.

The capacity of a Railroad, I assume to be dependent upon the power of the Locomotive to draw over its grades and curvatures a given load, and from this to the number of trips or loads it is capable of performing in a given period of time, from the points of supply and delivery, allowing however, sufficient time to intervene between its trips to keep the roadway in order, and for loading and unloading the materials to be transported, and that the requisites, strength, durability and permanency of Roadway, to enable it to do this, is altogether a matter of cost. That the advantages which one Road possesses over any other for capacity and ability to transport at less cost is due to grades and curvature I do not deny; that is a measure of comparison to ascertain whether capacity is not attained at a cost that would tax the articles to be transported beyond their market value, and consequently not admit of their being available for that purpose, but as I propose to show hereafter that this will not be the case with your Road, I shall proceed without further remark to the first point in order of consideration.

The Grades of your Road opposing the trade are 31⅔ feet per mile; on these a Locomotive weighing 20 tons, with its whole weight made available for adhesion, can haul a gross load of 336 tons, or deducting from this four-tenths, the proportion of dead weight, a nett load of 201 6-10 tons; and returning haul over the opposite grades of 63⅓ feet per mile, its train of empty cars and 60 4-10 tons of freight besides, or a gross load of 195 tons.

In estimating the number of trains which can be run over your Road, with a single track, Turnouts 10 miles apart, and speed of Locomotives at 10 miles per hour, I find that an interval of one hour and a quarter in their time of departure is necessary, to allow time for the repairs of track, loading and unloading of

cars, and that the trains returning may not be delayed at the Turnouts longer than seven minutes; with this interval the result is ten trains per day.

The average number of full working days in the year I estimate at 250. On the Reading R. Road the average for a series of years, ascertained from the reports of that Company is 210, but as your Road will not experience the same delays from snow and ice as are there met with, a greater number may reasonably be assumed. Applying these figures, the estimated capacity of your Road is a delivery of 2000 tons of coal per day,—annually 500,000 tons,—and with a double track 1,500,000 tons.

To estimate the cost of transportation per ton per mile, I have compiled and condensed into tabular form,—see Table G.,—the comparative cost of operating Railroads with different grades and curvatures, by the total miles run by trains, and with the mean of these results the cost of transportation per ton per mile on your Road.

Now estimating the load at 200 tons, to transport 500,000 tons annually will require 2500 trips; this multiplied by 90 miles—the circular trip,—gives 225,000 miles; adding 15 per cent. to this amount for the mileage performed by trains engaged in the Roadway and renewal Departments, the aggregate mileage is 258,750. Again, multiplying the total mileage by 83 24-100 cents, the mean as per Table, we have for the total cost of transporting 500,000 tons coal, the sum of $215,383 50, or, as the cost of transporting one ton of coal over your Road 43 07-100 cents, and per ton per mile 96-100 of a cent nearly. The cost of transporting coal on the Reading R. Road, as I derive it from their reports of 1854, '55 and '56, is (average) 59-100 of a cent per ton per mile. I therefore consider the increased charge on your road, 37-100 of a cent on the ton, sufficient to meet the increased cost, due for difference in their gradients, and more certainly so, when I know that your road will not be subject to but a small per cent. of the cost incurred by that Company for repairs and renewals of costly bridges, repairs of culverts, watchmen for bridges and tunnels, clearing the track of snow and ice, and State, City and County taxes, which charges, with the exception of State, City and County taxes and ground rents, are considered by that Company, and so estimated in determining the cost of transportation. I here

classify them, and give their average cost for the years above alluded to, to-wit: for repairs and renewals of bridges, watchmen for bridges and tunnels, and clearing ice and snow, $19,563, and for State, City and County taxes, and ground rents, $27,512 per annum. 5 per cent. on the first item alone, would cover the whole charges on your Road, as it will have none of the taxes enumerated in the last to pay.

Now with this as the estimated cost, I consider it in the power of your Company to carry over your Road, Coal from the mines on Deep River to the terminus on Cape Fear River at 2¼ cents per ton per mile. The Reading R. R. Company is now doing it for less, and is still able to pay a fair per cent. on its cost (including equipment,) of $19,000,000; if, therefore, such satisfactory results are obtained on a Railroad costing over seven times as much as yours, and without a corresponding increase of capacity, may we not rest assured, that it is a sufficient charge to afford a nett revenue, that will pay a large per centage on its cost, which I estimate at $1,250,000 when fully equipped to do a transportation of $500,000 tons.

It will be necessary, however, before submitting an estimate of what this per centage will be, to state, that an additional charge will have to be incurred by the Company on account of the transhipment of the Coal from the Cars into the Boats at the terminus on Cape Fear River. Estimating this at 10 cents per ton, the following result is obtained:

Receipts.		
By 500,000 tons coal at 2¼ cents per ton per mile, average of 45 miles,		$506,250 00
Expenses.		
To cost of transporting 500,000 tons at 96-100 of a cent. per ton per mile,	$215,383 50	
To cost of transhipment of 500,000 tons at 10 cts. per ton,	50,000 00	
		$265,383 50
Total nett receipts,		$240,866 50

Or 47 57-100 per cent. nett on the gross receipts, and a sufficient amount after appropriating $10,000 to renewal and depreciation fund to pay 18 4-10 per cent. on its capital stock.

To compare the above calculation with what has been done on a large number of Railroads in every State in the Union, (whose lengths, cost, expenses, &c., I could ascertain, see Table H,) it will be perceived, that my estimate will bear the application of practical tests, and when it is considered further, that your Road will have a trade not to be developed by slow degrees, but sufficient the moment it is put in operation to the Coalfields on D. River to work it to its utmost capacity, which many of those embraced in that Table do not enjoy, a result far more favorable for your road, than even the highest therein stated, may without a doubt be anticipated. That this traffic will be realized, and to show the mineral wealth of the country, to be penetrated by your Road, I refer you to the special report of Dr. E. Emmons, Geologist to the State of N. Carolina, made pursuant to instructions from the Governor of the State, in Dec'r 1857, and herewith submitted.

This report is so complete and conclusive on these subjects, that any remarks from me, in addition to what are there made and relative thereto, would be superfluous, except that I will only state more definitely the distances from the Coal Fields by your Railroad and the Cape Fear River to Wilmington, to-wit: from the Coal Fields on Deep River, by Western R. Road to terminus on Cape Fear River at Fayetteville 43 miles, thence by said River to Wilmington 120 miles, or a total distance from an Atlantic outlet by Railroad and River navigation of 163 miles, and that the charges for transportation will be $2 per ton for the whole distance. A continuation of your Road to intersect with either the Wilmington, Charlotte & R. R. R., or Wilmington & Weldon R. R., or by a direct route to Beaufort Harbor, would reduce this distance about 25 miles. For the direction your Road would take to adopt either of these connections, the accompanying map is prepared and submitted. This also with the one exhibiting the Coal region of Deep River, will afford all other information that may be desired relative to your Road.

All of which is respectfully submitted.

W. A. KUPER, Ch. Engineer.

A.—TABLE—TANGENTS AND CURVES ON THE WESTERN RAIL ROAD.

TANGENTS AND CURVES.	Length on Level.		Length on Grades 0 to 10 ft. per m.		Length on Grades 10 to 20 ft. per m.		Length on Grades 20 to 30 ft. per m.		Length on Grades 31⅔ ft. per m.		Length on Grades 30 to 40 ft. per m.		Length on Grades 40 to 50 ft. per m.		Length on Grades 50 to 60 ft. per m.		Length on Grades 63⅓ ft. per m.		Total Length on each Radius.	
	M	Feet	M	Feet	M	Feet	M	Feet	M	Feet	M	Feet	M	Feet	M	Feet	M	Feet	Miles.	Feet.
Tangents.	2	3070	1	3370	2	4040	3	3800	13	705	2	3295	1	931	2	1066	5	3	34	4440
Curves.																				
1° or 5730 ft. radius.		600		1800		740		680	1	544		975						3637	2	3696
2° or 2865 ft. "		1200						270	1	3170		857				2262		2674	2	5153
3° or 1910 ft. "		1100				860		2688	1	480									1	5128
4° or 1432½ ft. "								770											0	770
5° or 1146 ft. "						933													0	933
8½° or 655½ ft. "						1000													0	1000
																			43 miles.	

Length of 3° Curve on Grade of 31⅔ ft. per mile, and against trade 4900 feet.

Total amount degrees of curvature 936° 30′.

B.—TABLE OF GRADES ON THE WESTERN RAIL ROAD.

Length in miles & feet.	Ascending, Descending, or Level.	Inclination per mile.	Ascent in feet and decimals.	Descent in ft. and decimals.	Elevat'n ab'v'e starting point	Places.
1 1020	Level	Level				Surface water in Cape Fear
0 1350	Ascending	0 to 10	1.75			River 60 feet below start-
0 4900	Descending	0 to 10		3.08		ing point.
1 1920	Ascending	10 to 20	21.50			
0 1900	Descending	10 to 20		5.85		
0 5250	Ascending	20 to 30	26.25			
1 1020	Descending	20 to 30		35.28		
3 2260	Descending	31⅔		108.60		
1 3020	Ascending	30 to 40	58.10			
0 4200	Ascending	40 to 50	37.33			
0 4900	Ascending	50 to 60	48.68			
0 4000	Ascending	63⅓	45.20		86.00	Water in Lower L. R. 33
0 4600	Level	Level				feet lower.
0 100	Ascending	0 to 10	0.10			
0 500	Descending	0 to 10		0.80		
0 1600	Ascending	10 to 20	4.90			
0 2500	Descending	10 to 20		5.50		
0 3100	Ascending	20 to 30	15.90			
0 5200	Descending	20 to 30		23.30		
6 4920	Descending	31⅔		219 60		
1 2120	Ascending	30 to 40	53.50			
0 4200	Ascending	50 to 60	45.00			
3 4060	Ascending	63⅓	238.80		195.00	Upper L. River, water 25
0 4000	Level	Level				feet lower.
0 1000	Ascending	10 to 20	3.00			
0 2400	Descending	10 to 20		4.00		
0 2300	Descending	31⅔		13.80		
0 100	Ascending	30 to 40	0.60			
0 5200	Ascending	50 to 60	53.80			
1 3920	Ascending	63⅓	110.40		345.00	Summit.
0 3400	Level	Level				
0 1800	Ascending	0 to 10	2.40			
0 2400	Ascending	10 to 20	6.50			
0 1400	Descending	10 to 20		5.40		
0 1000	Ascending	20 to 30	5.00			
0 1000	Descending	20 to 30		5 00		
6 520	Descending	31⅔		193.20		[ft. lower.
0 1500	Ascending	50 to 60	15.60		170.90	Deep River sur'ce water 49
43miles	Total,		794.31	623.41		

C.—TABLE *of cost of Graduation of the Western Rail Road from Section* 15 *to Deep River. Length* 17 9-10 *miles.*

No. of Section.	Cost of each Section.	Remarks.
Section 16	$11,156 00	
" 17	7,800 00	
" 18	11,500 00	Terminates at Upper Little River.
" 19	13,600 00	
" 20	8,200 00	
" 21	5,075 00	
" 22	8,400 00	
" 23	7,100 00	
" 24	12,800 00	
" 25	14,000 00	To Deep River.
Upper L. R. Bridge,	5,000 00	
Total cost,	$104,631 00	

D.—TABLE—*Exhibiting the cost of Graduation of the Western Rail Road from Cape Fear River at Fayetteville to Section No.* 15, *inclusive, now under contract, and the amounts paid therefor and to be paid when completed, in Cash, Stock, and Bonds of the Town of Fayetteville and County of Cumberland. Distance* 25 *miles.*

No. of Section.	Estimated cost of Sections.	Amounts payable in cash	Amounts payable in Stock.	Amounts payable in Bonds.	Amount paid in cash.	Amount paid in Stock.	Amount paid in Bonds.	Balance due in cash.	Balance due in Stock.	Balance due in Bonds.	Remarks.
1	$8,700 00	$7,950 00	$750 00		$2,543 45			$5,406 55	$750 00		
2	14,584 67	13,126 20	1,458 47		13,126 20	$1,458 47					
3	26,455 93	18,030 84	8,425 09		18,030 84	8,425 09					
4	1,280 61	1,152 55	128 06		1,152 55	128 06					
5	7,352 73	6,617 46	735 27		6,617 46	735 27					
6	30,200 00	27,180 00	3,020 00		20,886 40	1,127 14		6,293 60	1,892 86		
7	9,413 96	6,669 50	1,372 23	1,372 23	6,669 50	1,372 23	1,372 23				To Little River.
8	4,100 00		4,100 00						4,100 00		
9	6,000 00	5,400 00	600 00		1,651 78			3,748 22	600 00		
10 & 11	12,400 00	10,704 89	1,695 11		4,631 00			6,073 89	1,695 11		To Spout Spring.
12	26,000 00	22,855 00	2,145 00	1,000 00	5,783 80			17,071 20	2,145 00	$1,000 00	
13	24,200 00	21,247 50	1,476 25	1,476 25	772 80			20,474 70	1,476 25	1,476 25	
14	7,100 00	6,390 00	710 00		3,218 93			3,171 07	710 00		
15	20,000 00	18,300 00	1,700 00		2,743 74			15,556 26	1,700 00		[Brick, &c.
	3,904 66	3,904 66			3,704 66			200 00			Iron Pipes, Bridges,
	8,000 00	6,882 00	100 00	1,018 00				6,882 00	100 00	1,018 00	For Little R. Bridge.
25 miles.	209,692 56	176,210 60	28,415 48	4,866 48	91,533 11	13,246 26	1,372 23	84,677 49	15,169 22	3,494 25	Aggregates

E.—TABLE—*Exhibiting, in detail, the cost of Superstructure of the Western Rail Road from Cape Fear River at Fayetteville to Lower Little River Depot, 13½ miles; thence to 25 mile Station, and thence to Deep River, 43 miles: The amounts to be paid therefor, by contracts, in Cash and Bonds of the Town of Fayetteville, and the amounts still requisite to complete the whole or in sections.*

Number of Miles.	Cost of Iron.	Chairs and Spikes.	Cross-ties and Laying Track	Total cost.	Am't payable in cash by contract.	Am't payable in Bonds by contract.	Balance in cash to complete.	Remarks.
11	$54,000 00	$4,400 00	$13,310 00	$71,710 00	$66,195 00	$1,632 00	$3,883 00	Rail 56 lbs. to the yard.
2½	12,500 00	1,000 00	3,025 00	16,525 00	2,774 50	368 00	13,382 50	Rail 52 lbs. to the yard.
	1,666 70	133 30	403 33	2,203 33			2,203 33	½ of a mile for turnouts.
				1,000 00	1,000 00			2 Turntables, castings, &c. for turnout.
				$91,438 33	$69,969 50	$2,000 00	$19,468 83	To Lower L. River Depot, 13½ miles.
11½	$57,500 00	$4,600 00	$14,950 00	$77,050 00				Rail 52 lbs. to the yard.
	1,250 00	100 00	325 00	1,675 00				½ of a mile for turnout.
				300 00				Castings, &c. for turnout.
				$79,025 00				To 25 mile Station.
18	$90,000 00	$7,200 00	$23,400 00	$120,600 00				Rail 52 lbs. to the yard.
	2,500 00	200 00	650 00	3,350 00				½ of a mile for turnouts.
				700 00				One turntable, castings, &c.
43 miles.	$219,416 70	$17,633 30	$56,063 33	$124,650 00				To Deep River, 43 miles.

Aggregate cost of 43 miles Superstructure, Turnouts, &c.....$295,113 33
Add for contingencies, &c..... 5,000 00

Total.....$300,113 33

F.—*Estimate of cost of Rolling Stock necessary to transport 240,000 tons of Coal annually, for one daily Passenger and tri-weekly Freight Trains, for Building and fixtures, additional Roadway, Land damages, &c. &c., and of the whole Line of the Western Rail Road.*

ROLLING STOCK.				
12 Locomotives, 20 tons each,	a	$9,000	$108,000 00	
500 Coal Cars,	a	250	125,000 00	
20 Box Cars,	a	650	13,000 00	
20 Platform Cars,	a	550	11,000 00	
20 Gravel Cars,	a	325	6,500 00	
2 Passenger Coaches,	a	2,250	4,500 00	
2 Baggage Cars,	a	1,200	2,400 00	
4 Hand Cars,	a	45	180 00	
				$270,580 00
BUILDINGS.				
Depots, water sta. and wood sheds, at intermediate points,			$10,000 00	
Engine House and Shops,			26,000 00	
Depot at Fayetteville,			4,000 00	
Depot and fixtures to tranship Coal, &c. at Cape Fear River,			25,000 00	
Engineering and salaries of Pres't, &c.,			15,000 00	
Land Damages,			15,000 00	
				95,000 00
For 3 miles of additional Roadway to reach different Coal Pits,			$45,000 00	
				45,000 00
For Grading and Superstructure, 43 m.,				614,436 89
Total cost of Line,				$1,025,016 89

G.—TABLE—*Exhibiting the cost of operating various Rail Roads in the United States, per mile run by Trains, compiled from their published Reports.*

Name of Rail Road.	Year.	Cost in cts. per m. run.	Remarks.
All Rail Roads in Massachusetts	1854	98.00	
All Rail Roads in New York,	1853	57.67	For Freight Trains.
Wilmington & Weldon R. Road,	1857	73.10	
Wilmington & Manchester R. R	1857	71.20	
Phila., Germantown & N. R. R	1851 to '56	71.33	
Orange & Alexandria R. Road,	1854	51.80	
Virginia Central Rail Road,	1855	74.20	
Ditto,	1856	68.00	
Ditto,	1857	72.11	
Baltimore and Ohio Rail Road,	1851	133.00	
Phila. & Reading Rail Road,	1856	84.60	Average for 3 yrs.
New York Central Rail Road,	1857	71.10	
New York & Erie Rail Road,	1857	68.60	
Richmond & Danville R. Road,	1857	89.10	
Virginia & Tennessee R. Road,	1855	79.00	
Pennsylvania Rail Road,	1857	138.00	
South Carolina Rail Road,	1857	113.30	
Richmond & Danville R. Road,	1856	96.40	
Phila., Germantown & N. R. R.	1857	82.00	For Freight Trains.
Baltimore & Ohio Rail Road,	1848	72.40	

Average 83.24-100.

State.	Length of Roads.	Cost of construction and equipment.	Receipts in 1856.	Working Expenses.	Aggregate Receipts per mile.	Per cent. net receipts.	Net per cent. on capital.	Average cost per mile.
Maine,	255	$9,945,893	$1,043,969	$714,313	$4,094	31.5	3.3	$39,003
New Hampshire,	237	8,339,260	1,221,871	719,271	5,155	41	6	35,187
Vermont,	384	17,834,737	1,589,669	1,261,450	4,139	21	1.8	46,444
Massachusetts,	1017	53,083,146	9,576,686	5,834,492	9,416	37	7	52,190
Rhode Island,	65	2,586,500	281,369	176,019	4,328	37	4	39,638
Connecticut,	489	18,274,382	2,766,343	1,485,430	5,657	46	7	37,370
New York,	2333	125,212,390	22,175,050	12,532,613	9,517	45	7.7	53,670
New Jersey,	364	21,140,854	3,711,775	2.088,993	11,949	43	7.6	58,079
Pennsylvania,	907	63,464,469	11,905,142	6,709,300	13,125	43	8	69,971
Maryland,	555	30,226,240	4,746,662	2,718,248	8,556	43	6.6	54,461
Virginia,	541	15,624,047	1,520,401	775,593	2,810	48	4.7	28,933
North Carolina,	171	2,331,000	344,636	196,000	2,015	43	6	13,643
Georgia,	326	8,239,045	1,497,954	690,688	4,595	54	9.8	25,273
Alabama,	219	10,701,528	421,329	202,102	1,923	52	2	48,862
Tennessee,	297	10,856,320	739,688	452,199	2,490	38	2.6	36,553
Ohio,	1300	43,959,274	1,473,945	3,442,391	4,979	46	6.8	33,814
Indiana,	318	7,501,833	1,731,640	986,196	5,445	43	10	23,590
Illinois,	1098	35,770,981	6,244,450	3,394,092	5,687	45	8	32,678
Michigan,	804	25,181,127	5,819,450	3,421,663	7,238	41	9.5	31,319
Wisconsin,	278	6,259,843	884,303	347,789	3,181	60	8.5	22,517
California,	22	1,200,000	162,200	85,400	7,373	47	6.4	54,545

SPECIAL REPORTS OF Dr. E. EMMONS,

GEOLOGIST TO THE STATE OF NORTH CAROLINA,

Concerning the advantages of the Valley of the Deep River as a Site for the establishment of a National Foundry.

Made pursuant to instructions from Gov. Bragg.

To His Excellency THOS. BRAGG,
Governor of North Carolina:

SIR: In obedience to your instructions which I had the honor to receive in a note bearing date December 26, I herewith respectfully present the following *special report*, "*on the advantages of the Valley of Deep River, as a site for the establishment of a National Foundry:*"

In the first place, permit me to observe that this subject came up for investigation in 1854, and that I then addressed a note to your predecessor, Gov. Reid, in which I attempted to set forth the advantages of Deep River for the object above specified.

Since the date of the note alluded to, I have been still more confirmed in the views then expressed, inasmuch as Deep River, as a manufacturing region, has become still more important in consequence of additional discoveries. But I should remark in this place, that the opinions I have heretofore expressed, and now entertain, are based upon certain premises, viz: that an eligible site for a National Foundry should combine in its location peculiar advantages, such, for example, as are connected with an ample supply of fuel of different kinds, abundance of the ores of metals, a full supply of timber, water power, materials for construction, a good climate, a spot accessible at all seasons of the year to government officials, and inaccessibility to an enemy without. To the foregoing I may add, that a good agricultural region which can furnish corn, wheat and cattle, is certainly very desirable, and would confer great advantages over one which is comparatively unproductive.

It is not, however, supposed that Government will engage in the business of reducing the ores of the metals; but, I have no doubt, that the value of the site for the purposes contemplated will be greatly increased, if it is on a spot where private individuals or companies are engaged in this business, and where all the different qualities of the metals, especially iron, are produced. They are then obtained at the least possible expense, and where, too, Government might well exercise a certain supervision, in order to secure those qualities which are the best for the use to which they are intended.

Similar remarks may be made respecting fuel; it is plain enough, that the fuel should be obtainable upon the spot. The necessity of transporting an article so much demanded, would be a great drawback upon any site where such a necessity as transportation existed; so, also, in regard to timber and materials for construction; if these were to be obtained from a distance, the expenses entailed upon the institution contemplated, would form, as in the preceding case, a great drawback upon the eligibility of a site thus located.

It is in consequence of a *combination* and *concentration* of advantages, that gives to Deep River an importance over all other places known to the author of this report; such advantages, for example, as are derived from an abundance of fuel, of ores, of timber, and suitableness of climate and location, which have been intimated as the necessary requisites of a location for the purposes designed by Congress.

I shall now proceed to state the facts respecting the natural productions peculiar to the valley of Deep River, and which, I hope, will be found to sustain, in every particular, the premises which I have laid down in the foregoing preamble.

1.—*Fuel in the Condition of Coal.*

Under this head the bearing of my statements will go to prove, both a great supply of this kind of fuel, and of a quality superior, in many respects, to any now in market, and which is especially adapted to manufacturing purposes.

The Deep River coalfield possesses all the essential characteristics of the better developed ones in this country, though its extent or area is comparatively small. Its outcrop of coal, or line upon which it has been proved to exist, is about 30 miles. This outcrop runs along the course of Deep River, and

is rarely, if ever, more than a mile from it. On this line, there are eleven different places where either shafts, slopes or pits have been sunk, and which have severally cut the main or 6 foot seam.

These coal shafts or slopes begin at Farmersville, the lowest point upon the river where coal has been fully disclosed. From Farmersville, proceeding up the river, we find in succession McIver's, Egypt, Taylor's, Gulf, Tyser's and Tyson's, Carbonton, Mrs. Bingham's, Murchison's and Fooshee's. There is no doubt of the existence of coal beyond the extremes I have named; but these being immediately as it were on the river bank, and all of them disclosing the existence of a continuous seam of coal, it is evident this segment of Deep River is the most important, and the one upon which capitalists must rely for their supply of this kind of fuel. Viewing this coal, then, only in the extent along which it has actually been developed, there seems to be no sufficient reason why doubts should be entertained of a supply for a long time to come. All doubts respecting a supply of coal will however vanish, when it is considered that even from one of the shafts enumerated, an ample supply may now be obtained; I allude to the Egypt shaft, as these works have been more fully carried out than at any other point upon the river. Here, there is a shaft 460 feet deep, and sunk 1,000 feet within the outcrop. It gives access to the main or 6-foot seam as it is called, though it exceeds that amount.

Here, the arrangements are so complete that a ton of coal can be raised to the surface every two minutes during the 24 hours. I need not go into a farther statement of the quantity which Egypt alone can now furnish; and when the other pits are brought into an equal degree of forwardness, it is plain that Deep River will not only furnish all the coal required for manufacturers there, but an immense supply for distant consumption.

The *quality of this coal is* a matter of considerable consequence. Tested in the smith's shop, the uniform opinion is, that it is cheaper for all work at 40 cents per bushel than charcoal at 5 cents. Smiths at Fayetteville have been in the habit of buying it at that price for several years. It contains a large proportion of volatile matter, at the same time it forms, during

combustion, a firm, hollow coke, which makes it so much sought for by smiths, and within which it furnishes an intense heat, which especially fits it for the performance of very heavy work. In the next place it is a gas coal. This property having been fully tested in Boston, New York and Philadelphia, it might be inquired whether the residuum left is valuable as a fuel. On this point, too, it is fortunate that there is so much testimony of the value of its coke, for it is a singular fact that the coke of many gas coals is of little value. The late Prof. Johnson, whose investigations in the department of coals are so well known, gave a very favorable account of it, entertaining no doubt of its high heating as well as reducing properties when employed for smelting the ores. In the region of Deep River the coke of the refuse coal will undoubtedly take the place of anthracite in the furnace and forge.

The composition of this coal, as determined by Johnson and Jackson, is as follows:

Fixed carbon,	63.6
Volatile matter,	34.8
Ashes,	1.6
Specific gravity,	1.3

Ash reddish brown.

The coal is also remarkably free from smuttiness or dirt, as well as sulphur and other impurities which injure mineral coals when employed for heating and reducing the metallic ores. Having, then, had this coal under examination for four years past, and having used it in a grate, and having observed its action in the forge, and having also the testimony of competent observers and experimenters as to its value for gas, as well as the value of its coke, there remains, as I conceive, not the shadow of a doubt as to its value when employed for melting iron, reducing its ores, or of its value for all manufacturing purposes where charcoal is not absolutely required.

2.—*Metallic Ores, particularly Iron.*

Five kinds of iron ore belong, geologically, to the Valley of Deep River, and are known to be centralized upon that portion of it where the coal formation is perfectly developed. Two of the kinds form inexhaustible beds in the coal measures, and one is so immediately connected with the seams as to require removal when the coal is mined.

The *hydrated argillaceous oxide* exists in a bed from 5 to 6 feet thick, 70 feet above the first coal seam. Its position and

connection is so favorable for mining that many tons may be thrown down every hour by a single miner. This ore is the kind which usually accompanies the coal measures of all countries. It possesses properties in common with the ores of this class, especially that of Pennsylvania and the carboniferous system of Wales. Its properties and value are too well known to require comment at this time.

The *black band* is the most important and valuable of all the ores of this formation. It first appears between the two proximate seams of coal, having a width of 15 inches. Below it is the 22-inch seam which is succeeded by about 15 inches of black band, which rests on another seam of coal 7 or 8 inches thick. About 30 feet lower are two beds of *black band*, whose thickness is 6 feet, separated by a seam of coal 1 foot thick, which is too much charged with the same ore as to admit of its use as a fuel. Both of these zones of black band are removed along with the coal, and being underlaid either by fire-clay or bituminous shale, is thrown down with little labor and expense. I speak of this for the purpose of showing that the cost of obtaining this ore is trifling when the arrangements are once made. The *black band* owes its value to the carbon which is combined with it. When properly roasted the ore is left in an open porous state, and in the condition of a protoxide, a fact which is evident from its strong magnetic powers. It is, therefore, a homogeneous ore, retaining still some carbon to aid in its reduction.

The composition of the black band ore is as follows:

Carbon and volatile matter,	40.62
Peroxide of iron,	47.50
Silex,	9.00
Sulphur,	trace.

From the foregoing it is evident that iron can be cheaply made from the black band, and as the best Scotch pig is made from it, a kind so much sought for in this country, it may be regarded as equally worthy of belief that the use of this ore will supply an article which has for a long time been imported, and thereby save us from the necessity of expenditures for this kind of metal.

The black band is known to be co-extensive with the coal formation. It is, therefore, inexhaustible, and its quantity is so great and so widely distributed that its use can never become a monopoly by any company. An estimate of the cost of ma-

king pig iron from this ore by an experienced and highly accomplished iron founder, was made at my request, and it appeared that pig, equal probably to the best Scotch pig, could be manufactured at a cost not exceeding nine dollars per ton.

I deem it will be sufficient to answer the purposes of this report to allude only to the *specular*, *magnetic* and *hæmatitic* ores of Deep River. The nearest locality of the specular is about 6 miles northwest from the Gulf upon the plankroad leading to Graham. The magnetic is about 6 miles farther in the same direction, and the hæmatitic occupies an elevated point known as the *Ore Knob*; situated 9 miles from the Gulf, and about the same distance from Carbonton. The latter was used in the time of the revolution, and the castings then made are remarkable for their toughness and strength. These three kinds of ore possess the usual properties and characteristics, and being unmixed with foreign matter possessing injurious properties, it is conceived that they also are fitted for all the purposes to which these ores are usually put.

From the foregoing statements it will appear that in the neighborhood of Egypt, the Gulf or Carbonton, there never can be any lack or want of raw materials for the manufacture of iron; and these several localities being concentrated in a limited region, it must strike every one at all conversant with this matter that here is a rare combination of advantages for the manufacture of iron in all the forms and conditions which the present state of society requires.

3.—*Timber for Construction.*

Deep River in its lower reaches skirts and passes through a belt of the long leaved pine. This belt of pine is mostly on its southern bank. On the east, north and northwest the oaks and hickories form the principal kinds of timber, intermixed however, more or less with the short leaf pine. A great forest of white oaks skirts the tributaries of the Haw River. This belt extends from the mouth of the New Hope to the vicinity of Chapel Hill. Its mouth is about 3 miles above the junction of the Haw and Deep Rivers. The Haw becoming navigable to the mouth, or near the mouth of New Hope, opens a way to this forest of many thousand acres occupied by this valuable tree. But as this, together with hickory, ash and elm, grow extensively throughout the valley and upon the adjacent slopes

skirting it, and, moreover, as the mild climate favors the rapid growth of all forest trees, it is a fair conclusion that there will be for years to come timber for all the purposes demanded for the construction of implements of war and of defence. It is to be recollected, in this connexion, that the forests have never been thinned by manufacturing companies, as is the case in New England and New York, neither has the long leaved pine been used for the extraction of turpentine.

4.—Quarries of Free Stone, Granite and other Stone for Construction.

The common rock of this coal formation is a red, brown or cream colored free stone, which, however, is interstratified with tender, brown or reddish shales. Free stone, of various textures and colors, are the common products of the formation. One hundred years exposure of this stone to the atmosphere proves it a durable material for building. The layers vary in thickness, they are soft and easily dressed when first removed from the quarry, but soon harden, when they become stable, and remain unchangeable. Grindstones, coarse and fine, are also of sufficient value to require a passing notice. Roofing slate may be obtained upon Rocky River, and granite of a superior quality at Buckhorn, on the Cape Fear.

5.—Water Power.

It is a question which remains to be settled by others, whether, upon a coal mine which must always furnish a large amount of fine coal, water should be employed for moving machinery, or steam. Whether this question is settled in favor of water or steam, it is certain, that the water power of Deep, Haw, Rocky and Cape Fear rivers are very important sources of power for moving machinery of some kind in this section of the State. On Deep River there are three falls; the lowest at Lockville, where the available fall is about 16 feet, which may be taken into a race from which the water may be used twice. Another fall of about ten feet, and which is partly employed, exists at the Gulf, and another still at Carbonton. Three miles above the junction of the Haw and Deep rivers there is a valuable water power upon the former, which, as it is connected with the latter by navigable waters, may be considered as belonging to it. It is bordered by banks which may be safely occupied by mills of any description. The falls of Buckhorn,

upon Cape Fear, 6 miles below Lockville, furnish by far the greatest power for moving machinery. If, therefore, water is required for any purpose connected with the business of a National Foundry, it may be obtained to an extent which a community of manufacturers may require.

6.—Accessibility.

The navigation of Cape Fear and Deep rivers is already secured. An outlet to the Atlantic is thereby obtained. The distance to Wilmington from the coalfield is 150 miles. Steamboats ascend now to Lockville, and will soon be able to reach Farmersville, Egypt and the Gulf. In addition to the foregoing, I may state that a railway is now being constructed from Fayetteville to the coalfields, which will pass through them and intersect the the Central Railroad at High Point. This road, when completed, will form an important chain of communication, which will put Deep River in immediate connection with the timbered sections of the State, and with the mineral region of the upper part of Deep River; and if continued to Salem, as contemplated by a railroad charter already granted, will also be connected with limestone, coal and iron, upon the Dan River.

So also, a link of 30 miles of road is to be yet constructed by which Deep River will be in connection with Raleigh, Weldon, Portsmouth and Norfolk, or Petersburg and Richmond. Or, if another route to the Atlantic is preferred, it may be obtained by the Atlantic and Goldsboro' Railroad. By these routes the seaboard is accessible in about 24 or 30 hours: 1st, by way of Wilmington; 2d, by Goldsboro' and Beaufort, and 3d, by Weldon and Portsmouth. Deep River may be reached in from 24 to 30 hours' travel from Washington.

It is scarcely necessary to say, that Deep River is inaccessible to an enemy from without.

7.—Climate and Soil.

Chatham county, through which Deep River flows, has a good climate, and its soil is adapted to the growth of wheat, corn and cattle.

In conclusion I may very properly say that Deep River possesses those advantages which a National Foundry requires in an eminent degree:

1. In its abundant supply of bituminous and semi-bituminous coals of the best qualities.

2. In its vast resources for the manufacture of iron.
3. In its materials for construction in wood and stone.
4. Ample water power.
5. In its soil and natural productions.
6. In its climate and good water for domestic purposes; there is neither the extreme heat of summer which debilitates, nor excess of cold in winter which closes the navigation of its rivers, or interferes with the movements of machinery.

With the foregoing summary of leading facts, I submit this report to your Excellency's favorable consideration.

I am, Sir, Your Excellency's obedient servant,

EBENEZER EMMONS,

Geologist to N. C., and late Geologist to N. Y.

Raleigh, 29th Dec. 1857.

Raleigh, March 27, 1858.

To His Excellency Governor Bragg:

Sir:——Since your instructions, bearing date Dec. 26, 1857, relative to the communication of facts having relation to the establishment of a National Foundry somewhere in the valley of Deep River, I have from time to time pursued my inquiries, and I now have the honor of communicating to your Excellency the additional information which I have acquired. This additional information, however, does not relate so much to the discovery of new locations of the metals, as to their composition; it amounts, therefore, simply to the determination of the chemical constitution of the ores already known to exist in this valley, with one exception, that of existence of a fine bed of iron ore near Buckhorn Falls, and about six miles below Lockville. The existence of ore at this place was known at the time my report was made; but I wished to ascertain one or two facts respecting it, before it was placed among the reliable resources of this valley. The Buckhorn ore is a massive peroxide of iron. Its composition is similar to the well known specular ore, but it is of a dull red brown color, and without crystalization; and is extremely heavy. Its streak is bright red, and it is rather tough, but is not difficult to break. It would strike one at once, on making but a slight examination of it, that it is a very rich ore.

The vein is eight feet wide, and is contained in the Taconic

Slates; in which respect, as well as in its composition, it closely resembles the ores of Lake Superior.

On submitting this ore to analysis, I found it composed of

Peroxide of iron,	95.20
Silex,	4.79
	99.99

According to the tables it contains 66.156 of metallic iron.

This vein of remarkable ore, being situated near the Falls of Buckhorn on the Cape Fear, must become an important addition to the resources of this valley. It contains neither alumina, manganese or lime; and I have not been able to detect sulphuret of iron; and I believe it is free from any injurious foreign substance. It may be transported for manufacture to any point, either upon the Cape Fear or upon Deep river; and I cannot discover any thing in relation to it, which can diminish its value for any kind of iron.

The next deposite of ore to which I wish to call your Excellency's attention, is upon the plantation which has been owned by Jonathan Wicker. It will be near the western line of Railroad leading from Fayetteville to the Coalfields, or about 6 or 8 miles south-west from Lockville. This bed belongs to the coal formation. It forms a bed in the bituminous slates, and is from 2 to 4 feet thick, and very heavy and massive. It is of bright brown red color, giving also, as usual, the red streak of peroxide. It contains

Peroxide of iron,	81.10
Silex,	18.90
	100.00

It contains malleable iron 56.84 per centum. It differs from the preceding in containing more silica, but no matters injurious to the quality of the iron which may be manufactured from it. Following the outcrop of the bituminous slates south-westerly, I found a very prominent outcrop of the brown ore, usually regarded as an argillaceous oxide of iron, at Evander McIver's, four miles from Egypt. This has a dark brown color in the mass, but in powder is ochre yellow or yellowish brown. It is very compact and heavy, and from its darker color in the mass might be suspected of containing manganese. This ore was worked in the Revolution, and it is said with good results. It is composed of

Peroxide of Iron,	97.00
Silex,	2.00
Carbon,	1.00
	100.00

It contains metallic iron 67.24. There is sufficient carbon to give the ore a dark tinge resembling that of manganese. It is nearly all dissolved readily in Hydrochloric acid.

I now propose to pass to the *brown magnetic* ore or *Magnetolite.* It is found upon the plantation formerly owned by Mr. Tyser. The peculiarity of this ore is, that it is magnetic, and has undoubtedly been changed by heat from the peroxide to the protoxide. It is probably an altered blackband ore, as it still retains a portion of its carbon. Its color is brown—reddish brown—and lies in lamina or regular strata, and is of considerable thickness. It was used also in the Revolution. It is composed of

Protoxide of iron,	79.720
Carbon,	7.368
Silica,	4.000
Water,	8.800
	99.888

It contains 61 per cent. of metallic iron. The powder of this ore is of an olive green, and its fragments are attracted by the magnet.

Preparations are already being made to work this ore, as from the state of oxidation it seems, too, well adapted to the catalan forge.

The iron balls so common in the coal formation differ considerably from the foregoing ores. They contain

Silica,	40.00
Peroxide of iron,	32.40
Carbonate of lime,	4.72
Carbonic acid,	18.21

They contain some volatile matter, bitumen and water, which is lost during ebullition with hydrochloric acid.

In addition to the foregoing ores, my attention has been directed to the limestones which are also in connection of the carboniferous slates. These limestones are undoubtedly hydraulic, but may be used in smelting the iron ores of this and other formations. One of these beds of limestone was cut in sinking the Egypt shaft. It is from 5 to 6 feet thick, and resembles, after exposure to the air for a few days, an argillaceous ore of iron. It is gray on the recent fracture, but becomes of a brownish drab on exposure to the atmosphere. It is slightly harder than the common limestone. It is composed of

Silex,	16.20
Carb. of iron,	19.380
Alumina,	0.750

Carb. of lime,	42.600
Carb. of Magnesia,	16.004
Water,	2.00

Part of the iron only is in combination with carbonic acid, though I have reckoned it as a carbonate.

Another bed of limestone occurs at Evander McIver's. It is blue and somewhat seamy, but not crystalline. It is composed of

Carbonate of lime,	46.00
Carbonate of magnesia,	28.70
Silex,	10 40
Water,	2 40
Protoxide of iron,	5.60
Bitumen and loss,	0.00

The bitumen is lost during its ebullition with hydrochloric acid, but not at a low ignition.

I deem it unnecessary to recapitulate what I had occasion to say in my Special Report relative to the composition of the black band ore; and, in conclusion, I have only to remark, that it is probable that the ores connected with the coal series are co extensive with that formation; but in this appendix to that report have thought necessary to speak only of it at those points where its outcrops form prominent masses in this series.

I am, Sir, most truly, your obedient servant,

E. EMMONS, Geol. to the State of N. C.

Trial of Deep River Coal at the U. S. Arsenal at Watervleit, N. Y.

"WATERVLEIT ARSENAL, April 7, 1858.

"To Col. H. K. Craig, Ordnance Dep't:

"Sir:—Under date of the 27th Nov. last, I was informed by Maj. Laidley that he had sent, by your direction, a sample of smith's Coal from Deep River, N. C., to be tested here. The coal was received on the 29th ult., and has been tried in the smith's shop, with very satisfactory results. For some time past we have been using coal from Frostburg, Ind., which is pronounced by the smiths to be better than they have ever worked with before at this Arsenal. The Deep River coal has been tried in comparison with this, and found to be fully equal to it in regard to the quantity of work that can be done with a given weight of coal. The Deep River coal is remarkably free from slate, dirt and sulphur; it makes a good hollow fire, but it burns with more blaze and greater outward heat than the other coal, which is rather a disadvantage for smith's use.

In an open grate it makes a beautiful fire, burning freely,

with a bright flame, giving great heat, and leaving little dirt or ashes. In short, I think this coal is of a superior quality, for any purpose for which bituminous coal can be used.

Respectfully, your obedient servant,

A. MORDECAI, Major, Ordnance.

TRIAL OF COALS FROM DEEP RIVER MINE, CHATHAM Co.,

Made at Northern Liberties Gas Works, June 22, 1855.

Trial 1st,—5 pounds of Coals gave 19.9 Cubic feet of Gas.
" 2d, " " " 20.8 " "
" 3d, " " " 20.5 " "
" 4th, " " " 20.25 " "

4)81.45

20.38

Two feet added for capacity of test apparatus, 2.00

Mean average of four trials, 22 38

Coke 3.5 pounds per 5 pounds of Coal.

On February 26th, 1856, a second test of Coal from the above, which resulted as follows:—

Trial 1st,—5 pounds of Coal gave 19.25 Cubic feet of Gas.
" 2d, " " " 21.25 " "
" 3d, " " " 21.25 " "

3)61.75

20.58

Two feet added for capacity of test apparatus, 2.00

Mean average of 3 trials, 22.58

Coke 4 pounds per 5 pounds of Coal.

N. B.—Two feet should be added to charges No. 1 of each test, on account of capacity of test apparatus. E. LANING.

May 2d, 1855.—Tested five pounds of Pictou Coal, from City Gas Works, at request of F. H. Odiorne, which gave 16 cubic feet of Gas, with an inferior Coke; time, 1 hour and 15 minutes. At the same time, five pounds of Cannel-Coal gave 20 feet of Gas, of good illuminating power—Coke deficient in quantity, but of good quality.

May 29th, 1855.—Five pounds of Midlothian Coal gave 18 feet of Gas, of tolerable illuminating power—Coke moderate; time, 1 hour 20 minutes.

June 5th, 1855.—Five pounds of Clover-Hill Coal gave 16 feet of Gas, with a tolerable Coke.

June 15th, 1855.—Five pounds of Alleghany Coal gave 18 feet of Gas, fair illumination and large amount of Coke, of inferior quality. E. LANING, Sup't.

Northern Liberties Gas Works.

J. Taylor
A. Jones
Jones Mill
E. Bryant

with a bright flame, giving great heat, and leaving little dirt or ashes. In short, I think this coal is of a superior quality, for any purpose for which bituminous coal can be used.

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" 3d,	"	"	"	20.5	"	"
" 4th,	"	"	"	20.25	"	"
				4)81.45		
				20.38		
Two feet added for capacity of test apparatus,				2.00		
Mean average of four trials,				22 38		

Coke 3.5 pounds per 5 pounds of Coal.

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Trial 1st,—5 pounds of Coal gave				19.25	Cubic feet of Gas.	
" 2d,	"	"	"	21.25	"	"
" 3d,	"	"	"	21.25	"	"
				3)61.75		
				20.58		
Two feet added for capacity of test apparatus,				2.00		
Mean average of 3 trials,				22.58		

Coke 4 pounds per 5 pounds of Coal.

N. B.—Two feet should be added to charges No. 1 of each test, on account of capacity of test apparatus. E. LANING.

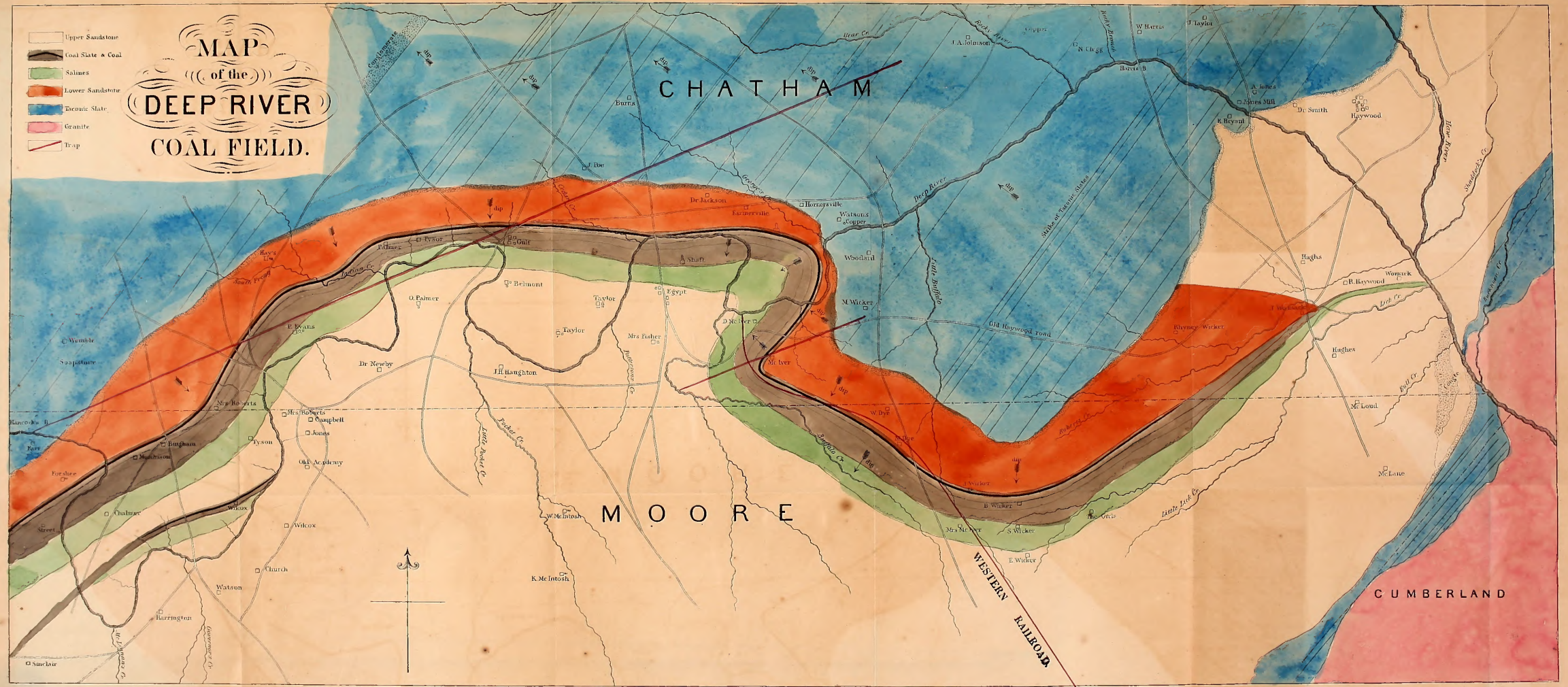
May 2d, 1855.—Tested five pounds of Pictou Coal, from City Gas Works, at request of F. H. Odiorne, which gave 16 cubic feet of Gas, with an inferior Coke; time, 1 hour and 15 minutes. At the same time, five pounds of Cannel-Coal gave 20 feet of Gas, of good illuminating power—Coke deficient in quantity, but of good quality.

May 29th, 1855.—Five pounds of Midlothian Coal gave 18 feet of Gas, of tolerable illuminating power—Coke moderate; time, 1 hour 20 minutes.

June 5th, 1855.—Five pounds of Clover-Hill Coal gave 16 feet of Gas, with a tolerable Coke.

June 15th, 1855.—Five pounds of Alleghany Coal gave 18 feet of Gas, fair illumination and large amount of Coke, of inferior quality. E. LANING, Sup't.

Northern Liberties Gas Works.


MAP
of the
DEEP RIVER
COAL FIELD.
Upper Sandstone
Coal Slate & Coal
Salines
Lower Sandstone
Taconic Slate
Granite
Trap
CHATHAM
MOORE
CUMBERLAND
WESTERN RAILROAD
Deep River
Rocky River
Haywood
Womack
Hughes
McLoud
McLane
Burma
Dr Jackson
Farmerville
Hornersville
Watsons Copper
Woodland
Gulf
Shaft
Belmont
Egypt
Taylor
Mrs Fisher
M Wicker
D McIver
McIver
Old Haywood Road
Rhyney Wicker
Dr Newby
J H Haughton
Mrs Roberts
Campbell
Jones
Old Academy
Tyson
Bingham
Chalmer
Wilcox
Church
Watson
Harrington
Sinclair
W McIntosh
K McIntosh
W Dye
B Wicker
S Wicker
E Wicker
Mrs McIver
The Grits
Womack
Hughes
McLane
Rocky Branch
Little Rocky
Buffalo Creek
Little Buffalo Creek
Robertis Creek
Little Rocky Creek
Bell Creek
Sandy Creek
Strike of Taconic Slates
dip

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